

Design and Manufacture of Pin Tools for Friction Stir Welding of Temperature-Resistant Materials, Phase I

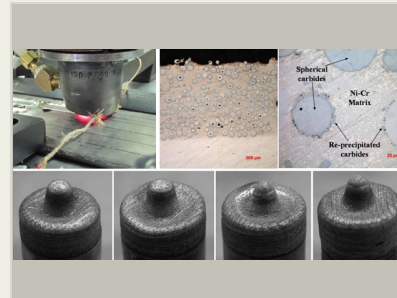
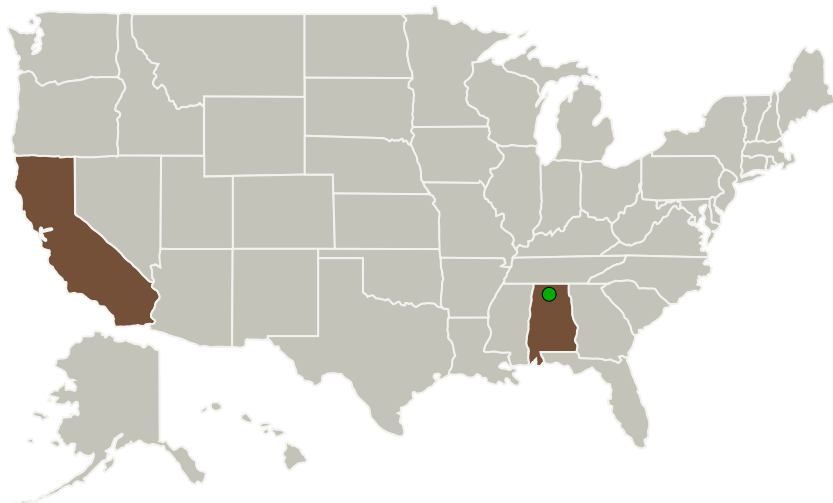
Completed Technology Project (2016 - 2016)



Project Introduction

The primary goal of this SBIR Phase I project is to advance the development of low-cost, functionally graded laser additive manufactured high temperature refractory and cermet pin tools for friction stir welding (FSW) and/or friction stir processing (FSP) of heat-resistant materials. A solid state process, FSW produces high quality welds in difficult-to-weld materials and is fast becoming the process of choice for manufacturing lightweight transport structures including for space launch vehicles. Development of pin tools for FSW/FSP of the high temperature materials is a major challenge, as current pin tools are expensive and often fail prematurely. Production of pin tools using an Additive Manufacturing (AM) approach could offer a viable option for producing near-net shaped and relatively inexpensive functionally graded pin tools suitable for welding high temperature materials. The near-net-shape nature of this process not only minimizes the amount of machining and grinding involved, but also greatly reduces the time for manufacturing, or repair, of the pin tools.

Primary U.S. Work Locations and Key Partners



Design and Manufacture of Pin Tools for Friction Stir Welding of Temperature-Resistant Materials, Phase I

Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

Design and Manufacture of Pin Tools for Friction Stir Welding of Temperature-Resistant Materials, Phase I

Completed Technology Project (2016 - 2016)



Organizations Performing Work	Role	Type	Location
Transition45 Technologies, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Orange, California
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations

Alabama	California
---------	------------

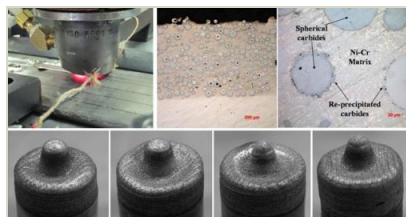
Project Transitions

**June 2016:** Project Start**December 2016:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139737>)

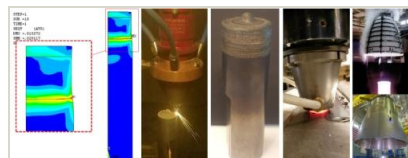
Images



Briefing Chart Image

Design and Manufacture of Pin Tools for Friction Stir Welding of Temperature-Resistant Materials, Phase I

(<https://techport.nasa.gov/image/126080>)



Final Summary Chart Image

Design and Manufacture of Pin Tools for Friction Stir Welding of Temperature-Resistant Materials, Phase I Project Image (<https://techport.nasa.gov/image/132456>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Transition45 Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

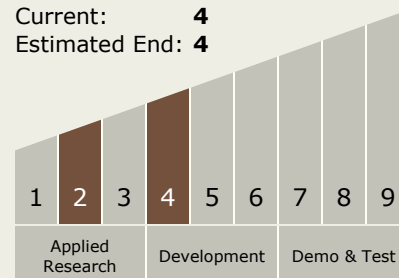
Carlos Torrez

Principal Investigator:

Edward Chen

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



Design and Manufacture of Pin Tools for Friction Stir Welding of Temperature-Resistant Materials, Phase I

Completed Technology Project (2016 - 2016)



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.7 Special Materials

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System